QP Code: SN22BTECH603 Reg. No | | | | | | | | | | | AR 21

Gandhi Institute of Engineering and Technology University, Odisha, Gunupur (GIET University)

B. Tech (Seventh Semester - Regular) Examinations, November – 2025

22BELOE47011/22BEEOE47011– Neural Network & Fuzzy Logic

(EE/EEE)

Time: 3 hrs Maximum: 70 Marks

Answer ALL questions

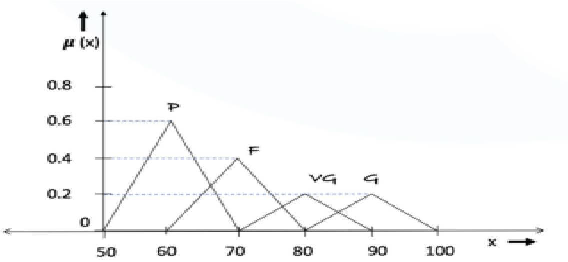
(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

Q.1. Answer ***ALL*** questions	CO #	Blooms Level
a. What is a fuzzy inference system?	CO4	K1
b. Define fuzzification and defuzzification.	CO3	K1
c. Draw the single-layer recurrent network and multi-layer recurrent network.	CO2	K2
d. State the fuzzy rule base in the Sugeno Fuzzy Inference System.	CO4	K2
e. Define binary and bipolar sigmoid activation function.	CO1	K1

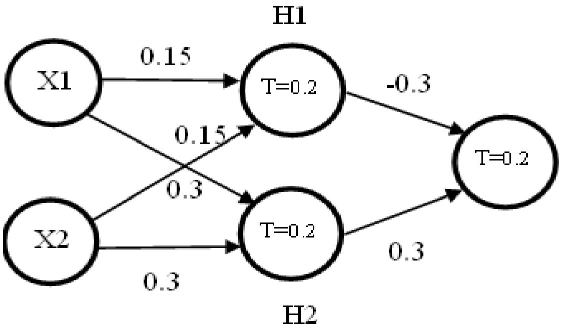
PART – B **(15 x 4 = 60 Marks)**

Answer ***all*** the questions	Marks	CO #	Blooms Level
2. a. Two fuzzy relations R1 and R2 are given in the following two tables $R_1 = \begin{array}{c\|ccc} & y_1 & y_2 & y_3 \\ \hline x_1 & 0.1 & 0.3 & 0.4 \\ x_2 & 0.2 & 0.1 & 0.5 \end{array}$ $R_2 = \begin{array}{c\|cc} & y_1 & y_2 \\ \hline x_1 & 0.5 & 0.2 \\ x_2 & 0.7 & 0.1 \\ x_3 & 0.2 & 0.6 \end{array}$ Find MAX-MIN composition (ii) MAX-PROD composition.	8	CO3	K3
b. Consider two fuzzy sets A=$\left\{\frac{0.3}{1}+\frac{0.3}{2}+\frac{0.4}{3}+\frac{0.5}{4}\right\}$ and B=$\left\{\frac{0.1}{1}+\frac{0.2}{2}+\frac{0.2}{3}+\frac{1}{4}\right\}$ Find the bounded sum and bounded difference of the given fuzzy sets.	7	CO3	K3
(OR)			
c. Explain the different types of membership functions used in fuzzification process?	8	CO3	K2
d. State and prove D' Morgan's Laws for the following fuzzy se $A = \{(x_1, 0.2), (x_2, 0.3), (x_3, 0.7)\}$ $B = \{(x_1, 0.3), (x_2, 0.9), (x_3, 0.5)\}$	7	CO3	K4
3.a. Two fuzzy sets are represented by $\bar{A} = \left(\frac{0.3}{x_1}\right) + \left(\frac{0.5}{x_2}\right) + \left(\frac{0.9}{x_3}\right) + \left(\frac{0.1}{x_4}\right)$ $\bar{B} = \left(\frac{0.7}{x_1}\right) + \left(\frac{0.3}{x_2}\right) + \left(\frac{0.6}{x_3}\right) + \left(\frac{0.5}{x_4}\right)$ Calculate(i)$\bar{A} \cup \bar{B}^C$(ii)$\bar{A}^C, \bar{B}^C$(iii)$(\bar{A} \cup \bar{B})^C$(iv)$\bar{A}^C \cap \bar{B}^C$(v)$(\bar{A} \cap \bar{B})^C$	10	CO3	K3
b. Describe various types of defuzzification methods in FLC.	5	CO3	K2
(OR)			
c. Let A be a fuzzy set that tells about a student as shown in the figure below. Here, the linguistic variable P represents a Pass student, F stands for a Fair student, G represents a Good student and VG represents a Very Good student. Calculate the defuzzified value for the fuzzy set A with weighted average method and center of sums.	8	CO3	K4



d. Distinguish between Mamdani FIS and Sugeno FIS. 7 CO4 K4

4.a. Draw a table of input and output for the network and identify the logic gate 8 CO2 K4

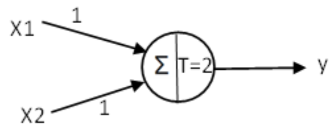


b. Define binary and bipolar sigmoid activation function. 7 CO1 K1

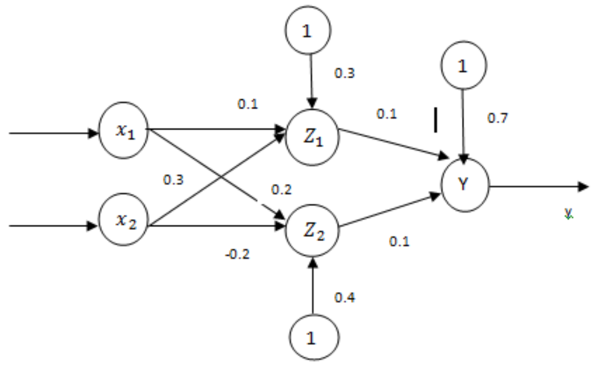
(OR)

c. Design a bipolar OR gate function using perceptron network. 10 CO2 K4

d. Identify the logic function realized by 5 CO2 K2



5.a. Using Back Propagation Algorithm, train the following network with a target of 1 and learning rate 0.2 for inputs of 0 and 1. 12 CO5 K5

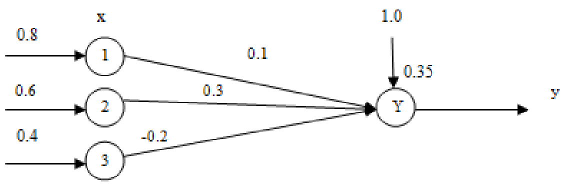


b. Give the mathematical form of Hebb's Rule. 3 CO1 K1

(OR)

c. Differentiate between Recurrent and non-recurrent neural networks neat sketch. 8 CO2 K2

d. Evaluate the output of the neuron y for the network shown in figure using binary sigmoid activation function. 7 CO2 K3



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